



*U.S. Department of Energy  
Ohio Field Office  
Fernald Closure Project*

# Transporting DOE Silos 1 & 2 Material from Fernald, Ohio

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## BACKGROUND

The Fernald site is a former Department of Energy (DOE) uranium processing facility located approximately 18 miles northwest of Cincinnati, Ohio. Formerly known as the Feed Materials Production Center (FMPC), the facility began operations in 1952 producing high purity uranium metal for the nations defense programs. Production operations ended in 1989 and Fernald was included on the National Priorities List established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Following CERCLA requirements, the Fernald site, now known as the Fernald Closure Project (FCP), developed plans to clean up the facility. These plans included demolition of buildings and structures, and the proper disposition of all wastes remaining in storage. This includes the removal, treatment, transport, and disposal of the waste products located in the Fernald Silos. This fact sheet provides information related to the transportation plans for the waste in Silos 1 & 2.

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## HISTORY

Silos 1 & 2 stored residues generated from the processing of high assay uranium ores at the FMPC and Mallinckrodt Chemical Works (MCW) in St. Louis, MO. The ores processed at MCW and the FMPC came primarily from one mine located in the former Belgian Congo. Those ores contained relatively high concentrations of uranium in the range of 40 to 50 percent as well as high concentrations of radium.

The term "K-65" was used at Fernald to describe the processing of the Belgian Congo ores, these materials are currently known as "K-65 Residues".

Uranium-bearing ores contain not only uranium, but also radionuclides that are a part of the natural-uranium decay chains. These radionuclides, including radium, are separated from uranium in the refining process. The refinery wastes, known as raffinates, contained a high concentration of the radioactive decay-chain products. Approximately 8,900 cubic yards of raffinates from the K-65 process were slurried into Silos 1 & 2.

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## CHARACTERISTICS OF SHIPPED MATERIALS

The Silos 1 & 2 material consists of uranium residue remaining after the extraction of uranium from uranium ore. Waste will be stabilized with a formulation of flyash, and Portland cement. The waste loading in the stabilized waste is expected to average from 17 to 20 weight-percent K-65 material; therefore, 80 to 83 weight-percent of the final stabilized waste form will be inert, non-waste material additives. Typical maximum radionuclide concentrations per waste package (pCi/g):

Radium	226	-	100,000
Thorium	230	-	15,000
Lead	210	-	100,000
Polonium	210	-	100,000
Actinium	227	-	2,000

The final physical form of the treated waste will be a concrete monolith inside a sealed steel-shipping container.



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## PHYSICAL DESCRIPTION OF SHIPPING CONTAINERS

6' diameter, 6.5' high, ½-inch thick cylindrical carbon steel containers with external volume of 196 cubic feet. Container design meets the Department of Transportation's (DOT) Industrial Package Type 2 (IP-2)

requirements. Containers have successfully passed all required DOT tests (i.e., free drop test and stacking test). Container will have a maximum weight of 21,950 pounds. The containers will be filled with the stabilized Silos 1 & 2 materials, weighed, labeled, and surveyed before being placed onto the flatbed trailer for shipping. There will be two containers on each trailer. The treated waste form will be a low compressive strength cement monolith with no free liquid present. Up to 7,000 filled containers are to be generated over an 11-month period. Anticipated direct radiation dose rates on the outside of the shipping container:

- 75 millirem/hour on contact (DOT standard specifies on contact dose rate shall not exceed 200 millirem/hour)
- 9 millirem/hour at 2 meters from the package (DOT standard specifies dose at 2 meters shall not exceed 10 millirem/hour)



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## WASTE CLASSIFICATION

DOE has classified the K-65 material as uranium byproduct. Section 11e.(2) of the Atomic Energy Act defines uranium byproduct material as “tailings or wastes produced as a result of the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.” Recent congressional language confirms DOE designation of the Silos 1 & 2 waste as 11e.(2) uranium byproduct material.

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## IDENTIFYING SHIPMENT CONTENTS

“Radioactive, Class 7” placards will be placed on the front, back, and both sides of the tractor trailer in accordance with DOT placarding requirements. In addition, all DOT required emergency response information will be contained in the shipping papers and readily available for all law enforcement and emergency response personnel. These are located in a pocket located on the driver’s door or within arm’s length of the driver. The FCP maintains a 24-hour emergency

response telephone number (513-648-4444) through its Communications Center. Communication Center personnel are trained in the communication and notification procedures in the unlikely event of a transportation incident.



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## SHIPMENT ROUTING

The routing will be determined upon award of the storage/disposal facility contract. The motor carrier transporting the material will be required to stay on the designated routes. These routes will utilize beltways around major metropolitan areas when available.

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## INSPECTIONS

The loading will be done inside the Silos 1 & 2 Remediation Facility. The DOT Type IP-2 packaging will be inspected by Quality Control (QC) personnel prior to filling. The flatbed trailer will be pulled into the facility and an overhead bridge crane will be utilized to load the filled containers. Once the packages are approved for disposal, loading of the trailers will be performed.

After the trailer is surveyed and released from the Silos area for shipment, the remaining paperwork is prepared. Individual containers of Silos 1 & 2 materials are tracked using the existing on-site waste tracking databases.

Inbound trailers will be inspected before being moved to the Trailer Staging Area (TSA) at Fernald. The TSA will serve as a place for staging of empty and loaded trailers, as well as maintenance and repair of unfit trailers.

Prior to departure from the site, the power units are inspected for roadworthiness and documentation verified for DOT compliance.



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## SHIPMENT TRACKING

Contracts will be awarded to carriers capable of providing safe, expeditious, and economical delivery of the shipments to the final destination.

Only motor carriers with satisfactory ratings under the Department of Energy Motor Carrier Evaluation Program (MCEP) are utilized.

The Fernald Closure Project provides a detailed briefing to every driver of radioactive material before the shipment departs the FCP. That briefing stresses response actions to take in the unlikely event of an accident or severe weather, instructions for maintenance of exclusive use shipment controls, and the requirements for remaining on the designated route. The FCP also requires motor

carriers to utilize a satellite tracking system (e.g., Qualcomm) for each shipment and has made arrangements with the motor carriers to access that data as necessary to randomly verify the motor carrier is adhering to the assigned routes. Motor carrier drivers that fail to adhere to the assigned routes are prohibited from hauling future shipments of material for the FCP.

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## EMERGENCY RESPONSE

In the unlikely event of an incident involving one of these shipments, State and local government agencies and the carrier would have the primary responsibility for response.

Every driver is provided a copy of the applicable Emergency Response Guidebook (ERG) page upon departure from the FCP. ERG No. 162 is applicable to the Silos 1 & 2 material. No other emergency response actions over and beyond the standards listed in ERG No. 162 are required.

Highway carriers have established Emergency Response Plans and have contingency plans for cleanup and recovery, if needed. DOE and its contractor, Fluor Fernald, Inc., have developed a Transportation Plan and will maintain a 24-hour emergency response telephone number (513-648-4444) to provide responders on-scene with comprehensive emergency response and incident mitigation information regarding the material in the shipment. In addition, DOE Radiological Assistance Program (RAP) teams are available in the event of an incident. RAP teams will be deployed as quickly as possible and no later than four hours after notification.

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